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New Method

Aortobifemoral Bypass Grafting with Reversed L-Shaped Technique for Endograft Infection

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Endograft infection after abdominal endovascular aortic repair is a rare but catastrophic complication associated with high perioperative mortality and postoperative recurrent infection. The optimal surgical treatment is still controversial, particularly regarding in situ or extra-anatomical revascularization. Herein, we describe a successful surgically treated case of a patient with an endograft infection complicated with abscess formation in the retroperitoneal space around the right common iliac artery. We performed an aortobifemoral bypass grafting using the reversed L-shaped technique by rerouting the right leg of the new prosthesis to avoid the infected area. The patient is doing well 1 year after surgery without recurrent infection. This technique was considered to be advantageous because revascularization could be performed remotely from the infected area.

Keywords: endograft infection, aortobifemoral bypass grafting, abdominal

Introduction

Endograft infection after endovascular aneurysm repair (EVAR) is rare but difficult to treat, and is associated with high perioperative mortality and postoperative recurrent infection. Antibiotics, explantation of the endograft, radical debridement of the infected tissue, and revascularization by covering the prosthesis with omental or muscle flaps are considered cornerstones of successful treatment.[1)] However, revascularization options, including in situ or extra-anatomical bypass grafting, remain controversial. We present a case of aortobifemoral bypass grafting with reversed L-shaped technique to avoid revascularization at the infected area in a patient with endograft infection after EVAR.

Case Report

Written informed consent was obtained from the patients for the publication of this article. A 76-year-old man complaining of fever and lower-right abdominal pain was transferred to our hospital. He had received antibiotic therapy for acute right pyelonephritis at a neighboring hospital 1 month prior to the admission. At the age of 73, he underwent EVAR for abdominal aortic aneurysm (AAA) and bilateral common iliac arterial aneurysms. Contrast-enhanced computed tomography (CT) scan showed expansion of the AAA sac accompanied by thickening in the surrounding tissue (**Fig. 1A**). Distal migration of the endografts was also noted (**Fig. 1C**). Abscess formation around the right common iliac artery and right iliopsoas lesion were suspected (**Fig. 1B** and **1D**). Blood cultures were positive for methicillin-susceptible *Staphylococcus aureus* (MSSA). Owing to right ureteral involvement, a ureteral stent was placed to relieve hydronephrosis (**Fig. 1B** and **1D**). According to

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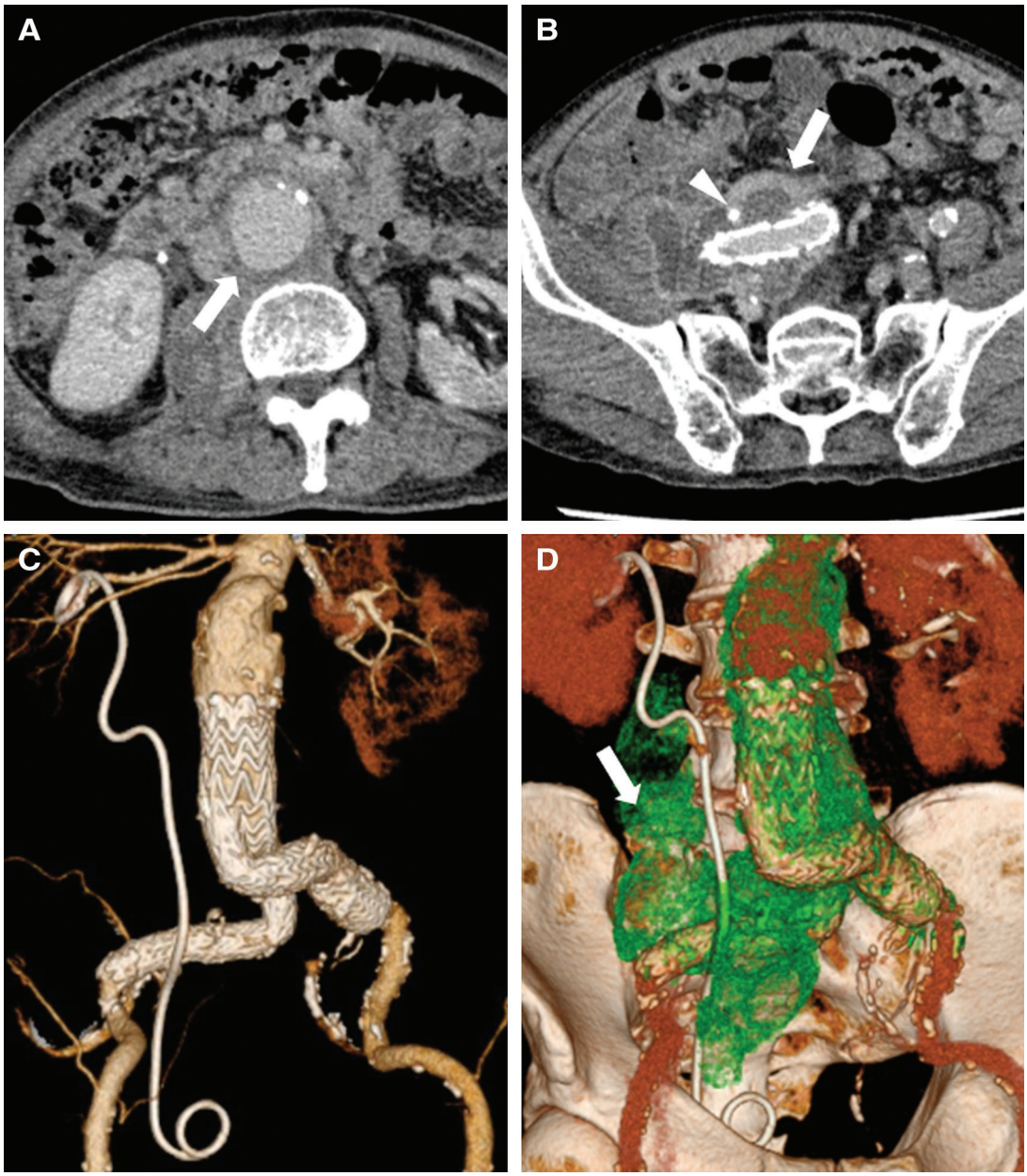

Fig. 1 Preoperative computed tomography scans. (**A**) Expansion of the aneurysmal sac with surrounding tissue thickening (arrow). (**B**) Abscess formation around the right common iliac artery and in the right iliopsoas lesion were suspected (arrow). The right ureter was involved in the infected area around the right common iliac artery (arrow head). (**C**) Distally migrated endografts and ureteral stent placed in the right ureter. (**D**) Abscess formation around the right common iliac artery is shown in the green-colored area (arrow).

these findings, the patient was diagnosed with endograft infection induced by right pyelonephritis and subsequent retroperitoneal abscess. Surgical treatment for the infected endografts was performed on an elective basis after antibiotic administration to improve the inflammatory response. A percutaneous right nephrostomy tube was placed prior to surgery for the possible necessity of radical debridement around the infected lesion. Following a laparotomy, extensive inflammation in retroperitoneal tissues and around the aneurysmal sac was observed; however, the fluid collection was not observed. There was dense adhesion of the tissues in the retroperitoneal space, which necessitated careful dissection. After cross-clamping the aorta above the right renal artery as well as both external iliac arteries, the aneurysmal sac was opened. The aneurysmal wall was thick, and

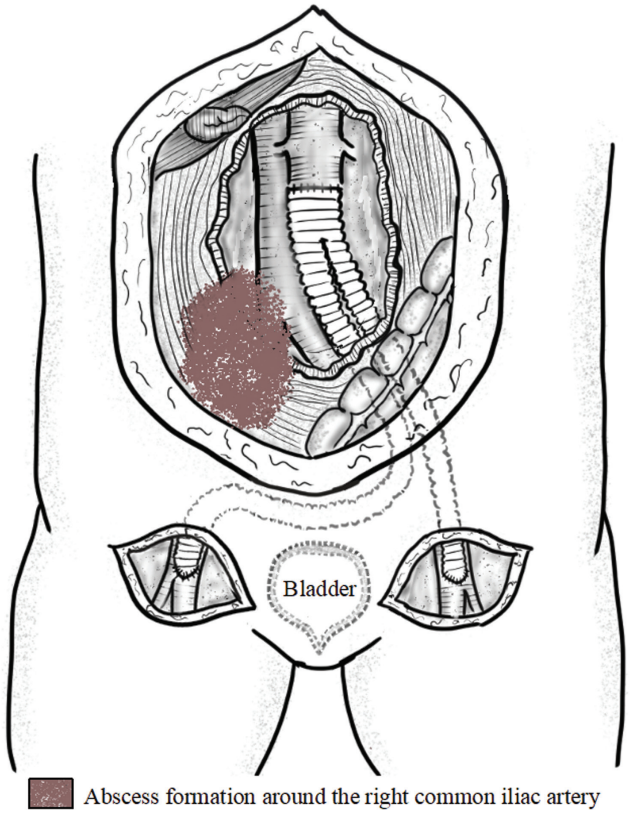

Fig. 2 Schematic drawing of aortobifemoral bypass grafting using the reversed L-shaped technique. **Video 1** (Available at online) The right leg of the graft was rerouted in the retroperitoneal space as the left leg. The right leg was guided through the prevesical space to the right groin and anastomosed to the right common femoral artery.

endografts were migrating distally. Thromboses that appeared to be infected filled the aneurysm. The endografts and thromboses were completely removed, followed by resection of the aneurysmal wall and radical debridement. However, the area around the right common iliac artery was clustered like an inflammatory mass, and we had to leave the area undissected to avoid the surrounding tissue injury. Therefore, we performed aortobifemoral revascularization with an 18 × 9 mm bifurcated expanded polytetrafluoroethylene (ePTFE) prosthesis using the reversed L-shaped grafting technique (**Fig. 2**). The graft was proximally anastomosed with the infrarenal aorta in an end-to-end fashion. Then, we created retroperitoneal routes for the leg of the prosthesis. The retroperitoneal routes were carefully created using blunt dissection with the surgeon's fingers and a dissecting forceps to avoid causing injury to the surrounding organs. The left leg of the graft was led to the ipsilateral groin passing through the retroperitoneal route behind the sigmoid colon and anastomosed with the left common femoral artery in an end-to-side fashion. The right leg was rerouted in the same route as the left leg, guided through the prevesical space to the right groin, and anastomosed with the right common femoral artery in an end-to-side fashion (**Video 1**). The graft was wrapped with an omental flap, and the graft and retroperitoneal space were soaked in hydrogen peroxide and coated with gentian violet and vancomycin after pulse flushing with normal saline containing povidone-iodine. The postoperative course was uneventful. Cultures of the aneurysmal tissue and endograft were positive for MSSA. Intravenous administration of antibiotics (cefazolin) was continued for 5 weeks with hyperbaric oxygen therapy until leukocyte and C-reactive protein levels were in the normal range. Postoperative CT scan showed good graft patency and no evidence of recurrent infection (**Fig. 3**). The patient continues to take oral antibiotics and is doing well 1 year after the surgery without recurrent infection.

Discussion

EVAR for abdominal aortic pathologies has been widely accepted with favorable outcomes comparable to open approach procedures. However, EVAR-related complications have been increasingly reported. Endograft infection is an uncommon EVAR-related complication; however, this catastrophic complication management is challenging because it is associated with high mortality and postoperative recurrent infection.[2] The optimal surgical treatment is not well defined as only a few case series have been reported due to its low incidence (0.4–3%).[3] There is controversy regarding the revascularization options, particularly between in situ and extra-anatomical bypass grafting.

Extra-anatomical revascularization (e.g., axillo-bifemoral bypass grafting) through a clean field has often been performed and has the advantage of reducing the risk of recurrent infections. However, disadvantages of this approach include aortic stump rupture and poor graft patency, which leads to lower limb ischemia. In comparison, in situ revascularization, in combination with complete explantation of endografts and radical debridement, is considered ideal and most effective.[4] However, considering the high-risk nature of patients requiring EVAR, this open surgical approach may be too invasive. Additionally, dissection of the pararenal aorta and iliac arteries is often complicated due to inflammation surrounding the endograft attachment sites.[4] Moreover, this approach may allow recurrent infections, as the graft passes

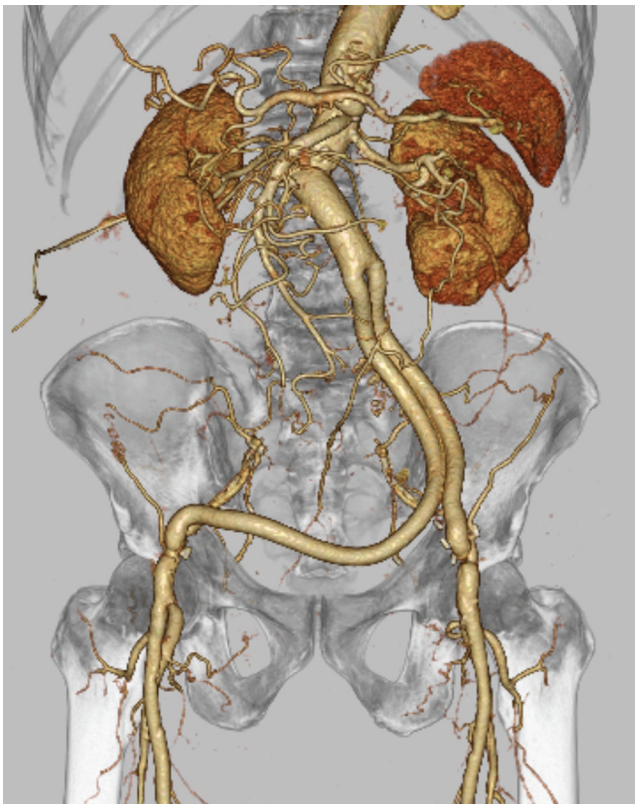

Fig. 3 Postoperative computed tomography scan showing the reversed L-shaped graft.

through the infected area if the infection cannot be controlled. Therefore, some authors suggest that extra-anatomical revascularization should be considered for high-risk patients, such as the elderly, those with high-grade infections, and critically ill patients.[4,5]

In the present case, we successfully performed an aortobifemoral bypass grafting using the reversed L-shaped technique in a patient with endograft infection after EVAR. This technique was previously reported as a surgical option for aortic aneurysms and aortoiliac occlusive disease.[6] To our knowledge, this is the first case report describing the efficacy of this surgical approach for abdominal aortic endograft infection. This technique is a useful option for managing endograft infection wherein the main infection is limited to the area around the unilateral iliac artery. Optimal prosthesis for infective disease remains controversial. However, we used ePTFE grafts including in the present case considering its less thrombogenic and infective properties than the Dacron grafts.[7] Furthermore, surgical maneuver itself is simple and does not require special equipment.

Our proposed technique has advantages of both in situ and extra-anatomical revascularization. It may reduce the risk of recurrent infection because revascularization is completed remotely from the main infection site, and aortic stump rupture and graft occlusion could be avoided. Furthermore, this anatomical reconstruction allows subsequent endovascular procedures, which are impossible after an extra-anatomical bypass, such as axillo-bifemoral bypass grafting.

Although this approach may be limited to patients in whom the main infection is limited to the area around the unilateral iliac artery, we believe that it could improve the outcome of endograft infection in this particular circumstance.

Conclusion

We successfully performed aortobifemoral bypass for endograft infection using a reversed L-shaped prosthesis without recurrent infections.

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Disclosure Statement

The authors have no conflicts of interest to declare.

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